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**Hydropower Investment
Promotion Project (HIPP)**

TRANSMISSION INVESTMENT PLANNING IN GEORGIA

DRAFT, AUGUST 2013

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(HIPP)

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DELOITTE CONSULTING LLP

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This document was prepared by

Author	Organization	Contact Details
Dan Potash	Deloitte Consulting LLP	dpotash@deloitte.com
Reviewer	Organization	Contact Details
Jake Delphia	Deloitte Consulting LLP	jdelphia@deloitte.com

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Definition of Abbreviations

ACER	Agency for the Cooperation of Energy Regulators
ANSI	American National Standards Institute
AVR	Automatic Voltage Regulator
BSTP	Black Sea Transmission Project
EC	European Community
ENTSO-E	European Network of Transmission System Operators for Electricity (was formerly the UCTE)
ESCO	Electricity System Commercial Operator
ESP	Energy Service Providers
EU	European Union
GDP	Gross Domestic Product
GEL	Georgian Lari (the currency)
GEMM	Georgian Electricity Market Model
GNERC	Georgian National Energy and Water Supply Regulation Commission
GoG	Government of Georgia
GSE	Georgian State Electrosystem
ISO	Independent System Operator
KPI	Key Performance Indicator
kV	Kilovolt
kWh	Kilowatt-hour
LSE	Load Serving Entity (same as a DSO, Distribution System Operator)
MoE	Ministry of Energy
MENRP	Ministry of Environment and Natural Resources Protection
MoESD	Ministry of Economy and Sustainable Development
MoF	Ministry of Finance
MV	Medium Voltage
NRA	National Regulatory Authority or Agency
PSS/E	Power System Simulator/Engineering
RA	Resource Adequacy
RCST	Reliability Capacity Services Tariff
RES	Renewable Energy Sources
ROI	Return on Investment
SCADA	Supervisory Control and Data Acquisition
SEE	South East Europe
SO	Service Obligation
TEAIS	Turkish Electricity Transmission Company.
TSO	Transmission System Operator
USAID	United State Agency for International Development
VOLL	Value of Lost Load
W	Watt
Wh	Watt-hour

1.0 Background

This document was compiled by a USAID-funded advisory project, Hydropower Investment Promotion Project. The HIPP project supports the Government of Georgia to attract investment from the private sector in modern, efficient hydropower plants. Since March, 2010, HIPP has supported market-based initiatives to promote and secure international investments into Georgia's small and medium-sized hydroelectric power market.

This document concerns the issue of power sector investment planning in the context of Georgia implementing a competitive power market model ("Georgian Electricity Market Model," or GEMM). Georgia is introducing a competitive power market and is otherwise enhancing and reforming its electric power sector for four main reasons:

- To secure domestic power supply for Georgia's population and industry
- To avail significant private investment for export-oriented hydropower plants located in Georgia
- To engage in beneficial electricity trade with Georgia's immediate neighbors: Turkey, Azerbaijan, and Armenia
- To harmonize and connect with the European Union for mutually beneficial electricity trade

In January of 2013, Georgia applied to become a member of the European Energy Community. Georgia had been an observer of the treaty since December 2007. The Energy Community consists of countries that have agreed on a common, stable regulatory and market framework in order to:

- Attract investment in power generation and networks in order to ensure stable and continuous energy supply that is essential for economic development and social stability;
- Create an integrated energy market allowing for cross-border energy trade and integration with the EU market;
- Enhance the security of supply;
- Improve the environmental situation in relation with energy supply in the region;
- Enhance competition at regional level and exploit economies of scale.

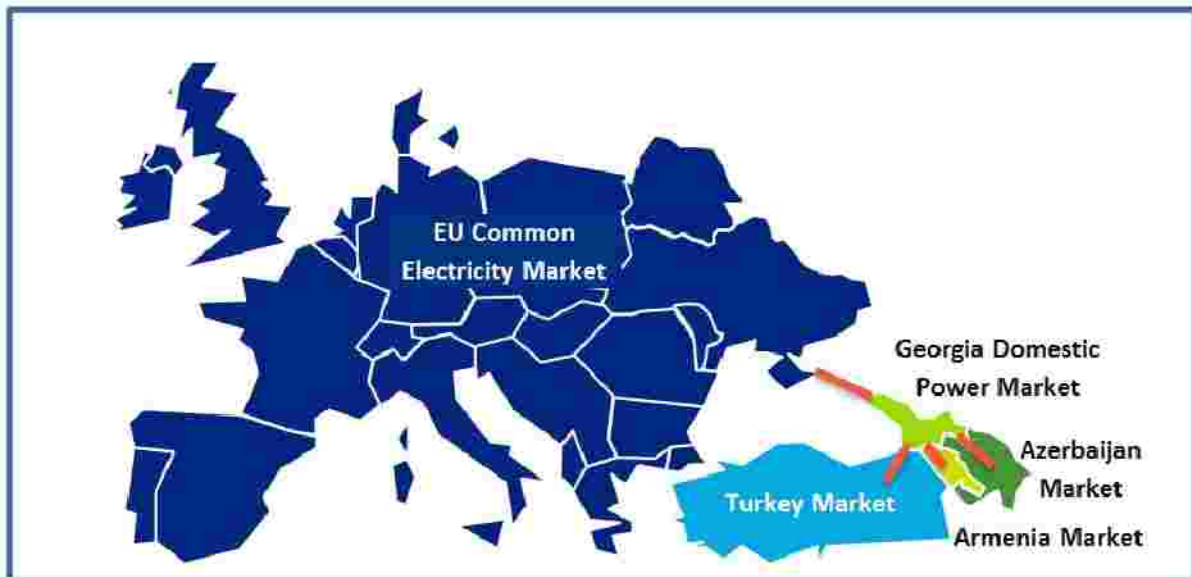
Georgia's application is subject to negotiation expected to begin in later part of 2013, and should end with an agreed upon set of legal and policy actions that Georgia must undertake in order to join the Energy Community.

Investment planning figures prominently into the Energy Community. Due to deregulation and cross-border interdependence, investment planning has become much more complex for countries in the EU itself, and for countries, like Georgia, hoping to serve the EU. Export opportunities, to neighboring countries and to the EU, for power generators in Georgia, can offer profitable opportunities for private sector investors in generation.

In Figure 1, "Electricity Markets," Georgia is shown in bright green, north of Azerbaijan and Armenia, and northwest of Turkey. Georgia's immediate neighbors could potentially find great value from Georgia's hydroelectric resources. Turkey's electricity is largely fueled by natural gas and coal. Azerbaijan's power sector is

largely run on oil and natural gas, and Armenia is run primarily on nuclear and natural gas. From a utility planning viewpoint, Georgia's regional contribution offers valuable fuel diversity and cost reduction, especially as fossil fuel prices rise.

Figure 1: Electricity Markets



Since 2003, the EU has been making rules to create a common electricity market including cross-border trading. This has required that each EU Member Country, and other bordering countries, meet strict technical, legal, regulatory and financial standards.

In 2011, Turkey joined the European Network of Transmission System Operators for Electricity and harmonized its legislation with EU directives to allow cross-border trading. Assuming that Georgia similarly legislates and conforms to the EU rules, there is an attractive economic opportunity for Georgia to be a significant regional energy exporter, and a transit operator.

Also, the priority of renewable energy development in Europe may confer on Georgia's hydropower plants special higher value, because of the need caused by wind and solar intermittency for backup capacity reserves with some level of flexibility of delivery.

The main problem with investment planning in the power sector, especially with regard to renewable energy generation, has to do with the priority and sequence of decision: whether to secure transmission capacity before securing a site and a PPA to build generation, or whether to secure a site for generation and a PPA before securing transmission capacity. Policy makers around the world are wrestling with this issue, especially so as to induce the higher amount of renewable generation that is often located far from load centers.

In the EU, there is a centralized network investment planning approach, and 10-year program for investments and improvements. The following excerpt, from the 10-Year Network Development Plan 2012, European Network of Transmission System Operators for Electricity, discusses this:

“Investments should positively address social welfare.

Socio-economic assessment of a project is carried out in order to evaluate its economic viability and overall impact. TSOs systematically undertake such studies. In general, the assessment takes into account the foreseen investment costs and benefits of the new projects. The investment costs are subject to uncertainties concerning the permitting processes or other supply chain considerations, and include capital / operational cost etc. On the other hand, benefit evaluation is a more demanding exercise since for example some technical improvements (for security of supply) or pursuing policy objectives (integration of renewable sources) are difficult to quantify.

Grid investments help so that bottlenecks are removed and so renewable generation is not bottled somewhere in the grid. This also includes how the benefits should be looked at on a wider pan-European level”¹

In order to create a Georgia market for electricity, more reforms are needed, with concomitant investment in transmission resources, and which offer economic choices and flexibility for producers and consumers. These additional reforms will require changes concerning technical matters, new laws, and regulatory and financial improvements. Although the challenges are daunting, there are well-established formats and structures being developed worldwide, and specifically by the European Union. There now is a body of experience from countries that have made the requisite changes in their power sectors, and have joined the EU common market structure, such as Bulgaria.

Relative to investment planning, Georgian policy-makers need to take near-term and medium-term actions. This document outlines more detail about investment planning in the power sector. It provides the current status regarding each issue in Georgia, the relevant worldwide best practices and EU requirements, and a suggested plan for activities for Georgian policy-makers, regulators, and power systems operators.

¹ 10-Year Network Development Plan 2012, European Network of Transmission System Operators for Electricity (ENTSO-E)

2.0 Investment Planning: Current Status in Georgia

Investment planning in Georgia is not yet comprehensive, and due to financial scarcity, it may in fact be driven by Donor financing priorities, rather than a clear strategic vision being implemented. For example, in currently existing Georgian legislation, there are general ideas about investment, such as the need for licensees to make adequate investments, but there are not specified performance indicators, and not a clear process to include recovery costs, and many other qualities that bear on investment to be mobilized.

The following points relate to current status of investment planning in Georgia in the Transmission Sector.

- a) The Georgian National Energy and Water Supply Regulatory Commission ("GNERC") has issued three licenses for HV electricity transmission activities in Georgia, as follows
 - i) JSC "Sakrusenergo" February 23, 2000; This is the link between Russia and Georgia. It also links Georgia with Azerbaijan and it owns the line from Batumi to Hopa, Turkey.
 - ii) JSC "Georgian State Electricitysystem" ("GSE"), December 20, 2002; GSE is the main transmission company in Georgia.
 - iii) JSC "Energotrans" (preliminary license), November 11, 2010 Energotrans is a fully owned subsidiary of GSE, and is implementing the Black Sea Transmission Network ("BSTN") project.

The licenses require each licensee to invest in capital plant and equipment adequate to carry out their licensed activities.

- b) GSE, as per its license is responsible party for investment planning for transmission, with responsibilities for determining:
 - i) Generation and demand forecasting, load flow analysis
 - ii) Transmission requirements to meet load and to serve generators
 - iii) Financial resources and restrictions
- c) Laws, decrees, regulatory orders, govern that GSE investment responsibilities
 - i) Article 34 of the Law of Georgia on Electricity and Natural Gas, requires that transmission companies: "Develop and submit to the Commission (the GNERC) and the public an investment program."
 - ii) GENRC is the regulatory agency that makes tariff orders for transmission rates for Sakrusenergo, GSE, and Energotrans. The tariff order is the recovery mechanism by which the TO's recover their investment in systems. GENRC has some fundamental issues to contend with, in terms of the allocation of benefits for transmission that is used to serve domestic customers, and also used to serve export markets (Georgia generation destined for export) and also transit market (imported generation that is used to serve export markets).

- iii) Grid Code Chapters 3 and 4. The proposed Grid Code is under development with support from HIPP project. There is not a clear picture when it in its entirety may be adopted, perhaps in 2013.
 - (1) Proposed Grid Code Chapter 3, Transmission Planning Code," elaborates planning processes that are consistent with EU requirements. "This chapter provides a framework of the process, applicable procedures, technical and planning criteria, interaction and information exchange between the TSO, Transmission Licensees, Transmission Applicants, and Transmission System Users for the purpose of coordinated planning of development, upgrades and further expansion of the National Electricity Transmission Grid hereinafter referred as Transmission Grid."
 - (2) The Proposed Grid Code would, when adopted, establish a plan, and would, in turn, would imply investment requirements. According to the current draft of the Grid code: "The regular Transmission Grid planning activities shall culminate into Transmission Grid Development Plan(TGDP). The Transmission Licensees (Transcos) shall prepare the investment plans of their Transmission Systems based on TGDP and Project Allocation Procedure approved by GNERC."
- iv) Electricity (Capacity) Market Rules, initially approved by MoE on August 2006, and amended April 2013.
 - (1) Market Rules call for the cost of normative losses to be recovered from end users. The cost of above-norm losses are borne by the transmission licensee.
 - (2) Many problems exist in this formulation, as follows: The process to set the appropriate level of normative losses is not described. Making losses lower is a function of investment, but there is not a treatment of this in Market Rules. Also, the losses are to be borne by transmission licensee(s), not specifying if losses would be responsibility of TSO or TO in an unbundled GSE.

3.0 EU Requirements and Practices

- a) EU Directive 2009/72 of the European Parliament and of the Council, 13 July 2009 concerning common rules for the internal market in electricity.

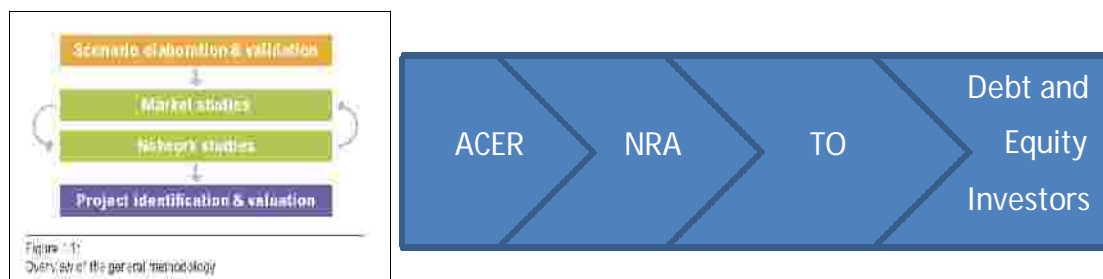
Regarding investment planning, Directive 2009/72 says that:

- i) Market prices should motivate new investment. Member states can authorize new generation according to criteria and make open competitive tender for new capacity. An independent body should manage the tender, can be the regulator, or the transmission organization, if the transmission organization is fully independent of generation and supply.
 - ii) Planning: This directive calls for national energy action plans, ensuring long-term ability of the system to meet reasonable demand through investment planning.
- b) Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishes the Agency for the Cooperation of Energy Regulators (“ACER”). ACER monitors the power sector, advises the EU commission, and advises national regulatory commissions.
- c) European Network of Transmission System Operators for Electricity, ENTSO-E, created by Regulation (EC) 714/2009

Regulation (EC) 714/2009 requests ENTSO-E to “adopt a non-binding Community-wide ten-year network development plan” (TYNDP) with the objective to ensure greater transparency regarding the entire electricity transmission network in the Community and to support the decision making process at the regional and European levels.

The general methodology of the plan is shown in Figure 2, along with the relationship of the plan to ultimate investment. The TYNDP is meant to indicate needed investment in transmission to allow grid interconnections, access to renewables, free competitive trading markets, and in general to meet all the goals of the EU common energy market.

Figure 2: Project Identification in the Ten-Year Network Development Plan



The TYNDP is submitted to the EU Agency for the Cooperation of Energy Regulators (“ACER”) for commentary. If approved by ACER, it is then taken up by National Regulatory Authorities (“NRA”) in each country. Generally ACER makes recommendations to the transmission system operators, national

regulatory authorities or other competent bodies concerned with a view to implementing the investments in accordance with the Community-wide network-development plans. The NRA's in turn directly cause the Transmission Operators ("TO") or the Independent Transmission Operators ("ITO") to make the investment and to allow cost recovery, which, pro eo, allows them to access debt and equity investment.

4.0 Steps for Georgian Transmission Investment Planning

Investment planning requires expertise in the spheres of legal, financial and economic matters. As it regards secondary legislation necessary to implement EU framework, the MoE and GNERC must each have specialized expert knowledge on EU legislation as each must complete different types of legislation compliant with EU energy acquis. More information on this will be known upon completion of the final Energy Community roadmap agreed between the GoG and the EU.

The proposed Grid Code is a key element in the transition from planning process to the target process that is consistent with GEMM 2015 and with EU energy acquis. Specifically the proposed Grid Code calls for this information to create an adequate Transmission Grid Development Plan:

- i. Overall and regional characteristics of the Transmission Grid;
- ii. Evaluation of the current performance of the Transmission Grid, including comprehensive analyses of any portions of the transmission system that do not meet planning criteria;
- iii. Transmission capacity for transmission lines at or above 110 kV;
- iv. Power flows at maximum load on the Transmission Grid;
- v. Load at connection points of Transmission Users at maximum load;
- vi. Levels of short-circuit currents in substation buses at or above 110 kV;
- vii. Transmission and transformer losses;
- viii. Proposed Transmission Grid Development based on load growth;
- ix. Proposed Transmission Grid Development based on new generating units;
- x. Proposals for construction of new interconnection transmission lines and substations;
- xi. Scheduled power interchanges with external (foreign) entities.

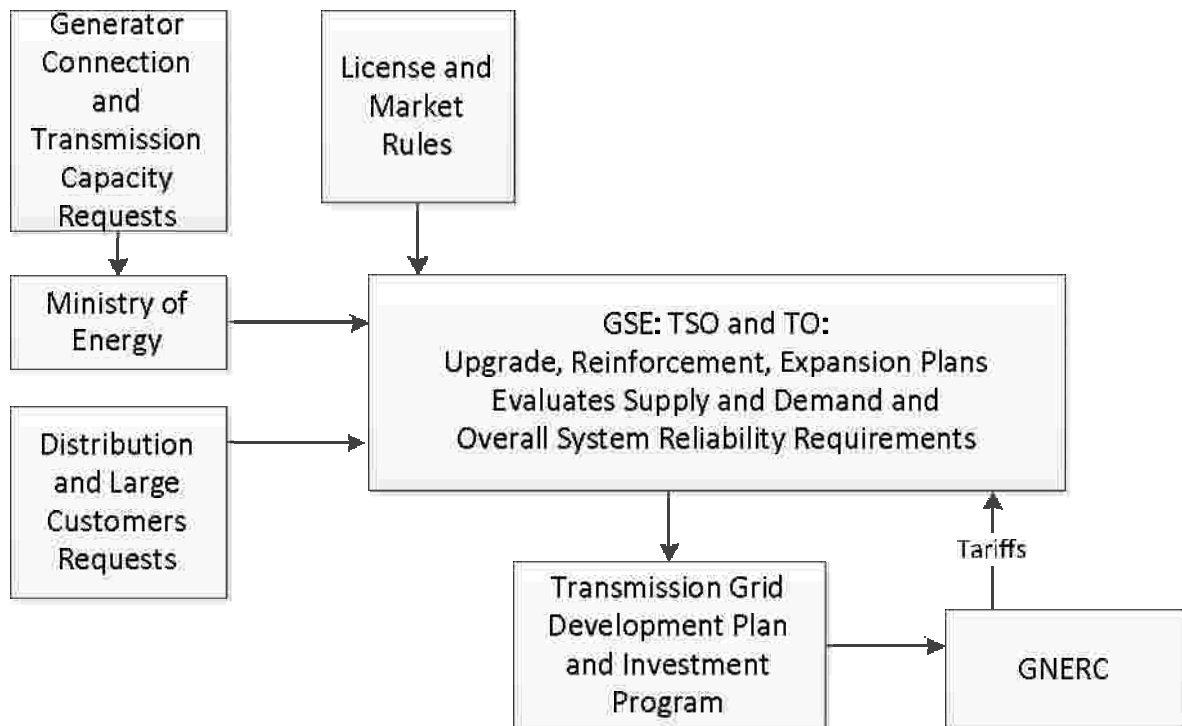
Also it calls for information about expected demand and generation:

- i. Demand forecast for the ten year period;
- ii. Amount of required generation reserve for the system;
- iii. Description of existing generation including retirement and refurbishment plans;
- iv. Description of planned new generation plants with a signed memorandum of understanding or connection agreement;
- v. Imported and exported energy on a historic and projected basis;
- vi. Analysis of the country's power supply and demand supply balance;
- vii. Amount of remaining capacity and energy requirements on an annual basis to meet forecast demand, energy and reserve requirements;
- viii. Recommendations if commissioning of planned generation plants is delayed;
- ix. Recommendations for obtaining remaining capacity and energy requirements.

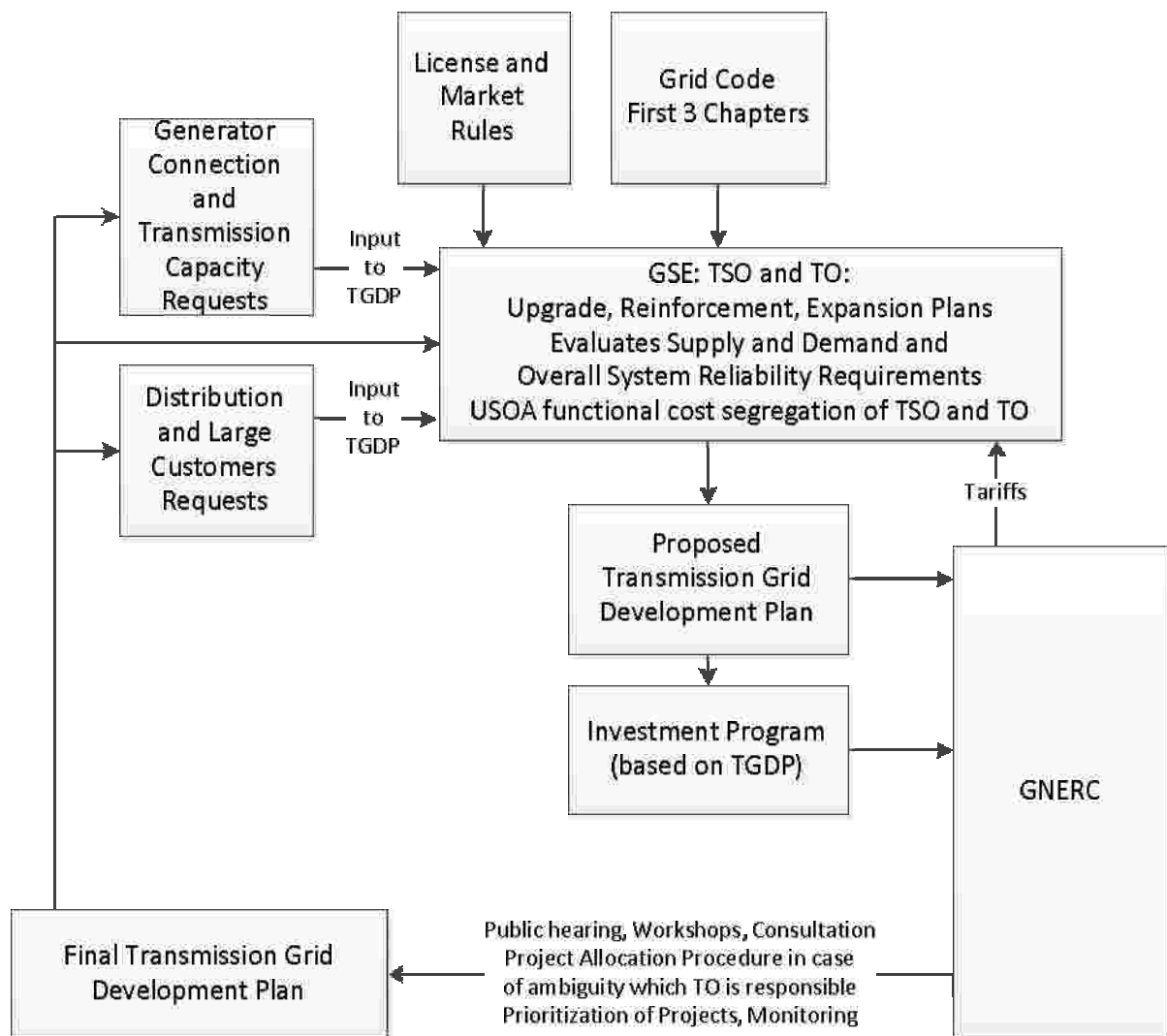
On the following pages are schematical depictions existing planning, process, and transition to target to be consistent with GEMM 2015:

- GSE Investment planning Framework – Existing (2013)
- GSE Investment planning Framework – Transition (2014-2015)
- GSE Investment planning Framework – Target (2015)

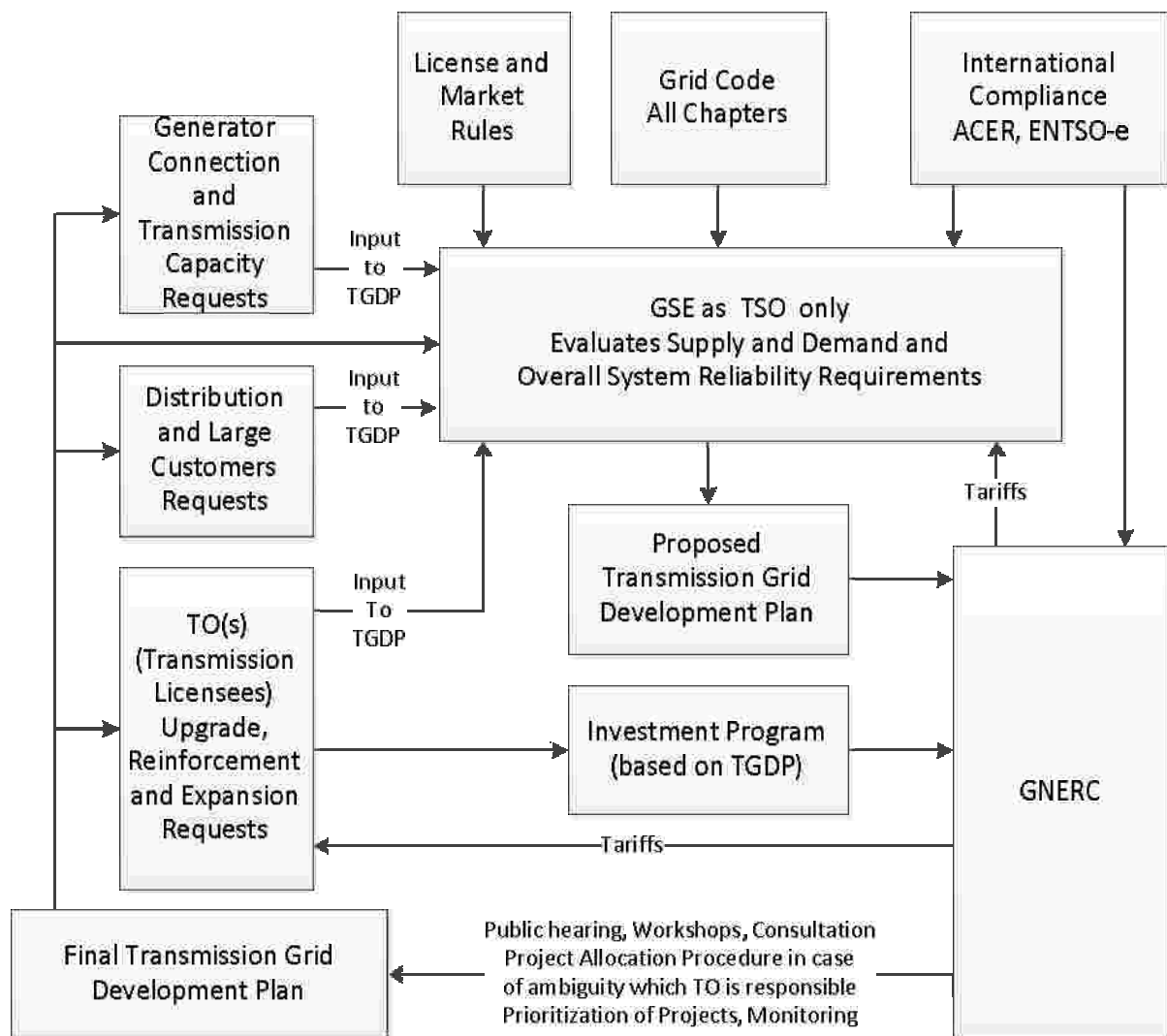
GSE Investment planning Framework – Existing (2013)



GSE Investment Planning Framework – Transition (2014-2015)



GSE Investment Planning Framework – Target (2015)



5.0 Near Term Next Steps

In order to prepare for, and to execute the transition to necessary investment planning, the following specific near term activities should be done:

- 1) Consistent with proposed Grid Code, in preparation for an Investment Plan, GSE needs to engage in audits and create a justified plan for upgrades. This would entail:
 - a) Transmission asset inventory, condition, performance, remaining life, transformer condition, line condition and loading
 - b) Operational audit of GSE; organization structure, staffing, HR gaps, induction and retention strategy, compensation, rewards, incentives
 - c) Make a specification for upgrade its equipment and materials procurement and inventory control, and construction standards, with respect to supporting investment decisions.
- 2) GSE should prepare for compliance with investment related aspects of European Energy Community, most critically including Directive 2009/72 and Regulation (EC) 714/2009.
- 3) GSE make forward-looking transmission access plans for renewables under both expected and optimistic planning scenarios, evacuation of power from planned or unilaterally proposed HPP's. Forward-looking means anticipating likely renewable energy power project development.
- 4) GSE should determine detailed specification and procurement for energy and voltage metering, communications, database, trading software, reporting modules; also assist in choosing and installing accounting software including data flow from work order to company accounting. These systems will feed the database that drives investment decisions taken by GSE.
- 5) GSE should make studies, and obtain expert advice on the investment impact of loss reduction measures, using interventions such as:
 - a) Reactive power compensation
 - b) Reconductoring
 - c) Transformer replacement, substation expansion
- 6) GNERC should prepare to make a report as would be required to ACER per Electricity Directive 72, Section 37 (1) e, i.e., reporting annually on its activity and the fulfillment of its duties to the relevant authorities of the Member States, the Agency and the Commission.
- 7) MoE and MoF should evaluate the opportunity for Public Private Partnerships to develop and finance new transmission infrastructure.
- 8) MoE and MoF should evaluate the opportunity for multi-country sponsored and financed transmission business opportunities.
- 9) GNERC should review and assess of electricity transmission pricing arrangements.
 - a) comprehensive review of the electricity transmission pricing arrangements in place, including an examination of:

- i) the methodology used for setting transmission charges
- ii) the current data sources, data models, and information systems used for setting, reviewing, and adjusting standards and transmission tariff components in accordance with the transmission pricing methodology
- iii) current procedures for setting transmission charges
 - (1) applicability of the methodology
 - (2) methodology for setting, reviewing, and adjusting transmission charges;
 - (3) applicability of procedures used for setting, reviewing, and adjusting transmission charges;
 - (4) staff capacity in determining, reviewing, and adjusting the components of the transmission tariff;
 - (5) availability of staff manuals, their applicability, adequacy and user friendliness for setting, reviewing, and adjusting transmission charges; and
 - (6) possible deficiencies in procedures and their use.
- b) GNERC should make a determination of pricing components for effective implementation of transmission pricing. Especially, GNERC should determine how investments proposed in the TYNDP will be included into the tariffs, so as to avoid decapitalization of the physical plant.
 - i) gathering required data, as well as updating and, if required, developing new models, procedures, and mechanisms for calculating standards and transmission charge tariff components, including (a) determination of the standard profit allowance and assessment of weighted average cost of capital, (b) determination of the capacity charge component, (c) determination of the connection charge component, (d) determination of unit costs for transmission revenue requirements, and
 - ii) determination of any other standards and transmission charge components as identified under outputs A and B;
 - iii) revising and developing staff manuals and guidelines for setting, reviewing, and adjusting transmission price components; and
 - iv) Providing on the job-training to staff of the GNERC for setting, reviewing, and adjusting transmission price components.

USAID Hydropower Investment Promotion Project (USAID-HIPP)

Deloitte Consulting Overseas Projects - HIPP

11 Apakidze Street, Tiflis Business Center

Tbilisi, 0171, Georgia